

REMARKS

Applicants have now had an opportunity to review the April 18, 2007, Office Action and request reconsideration of the application.

Claims 1-5 are currently pending in the application. Claims 1 and 5 are amended.

The Office Action

The Abstract was objected to under MPEP §608.01(b) for containing two paragraphs. An amended abstract is placed in single paragraph form. Accordingly, it is respectfully requested that the objection be withdrawn.

Claim 1 was rejected under 35 U.S.C. §102(b) as being anticipated by Tennet, et al., U.S. Patent No. 6,099,965.

Claims 1 and 3 were rejected under 35 U.S.C. §102(b) as being anticipated by Zhang, et al., U.S. Patent No. 6,110,619.

Claims 1 and 4 were rejected under 35 U.S.C. §102(a) as being anticipated by Fukushima, et al., Science, 2003, 300, pp. 2072-2074.

Claims 2-5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Tennet, et al., U.S. Patent No. 6,099,965, in view of Smalley, et al., U.S. Publication No. 2002/0046872.

Claims 2 and 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Zhang, et al., U.S. Patent No. 6,110,619, in view of Smalley, et al., U.S. Publication No. 2002/0046872.

Claim 1 was provisionally rejected on the ground of non-statutory obviousness-type double patenting.

Claims 1-4 are rejected as being anticipated by Fukushima, et al., Science 300, pp. 2072-2074 (2003) (see Note 3 on p. 3 of the Office Action).

Claim 1 was provisionally rejected for nonstatutory double patenting.

(I) The Double Patenting Rejection

Claim 1 as currently amended, recites a gel comprising a carbon nanotube and an ionic liquid. The ionic liquid is a salt which assumes a molten state at or very near room temperature.

Claim 1 of copending U.S. Application Ser. No.10/567,740 currently recites a conductor material for actuator element, the conductor material comprising a gel comprising carbon nanotubes, a polymer, and an ionic liquid.

It is submitted that the amendments made in both applications have resulted in claims which are not properly the subject of a double patenting rejection. In particular, present claim 1 does not require a polymer (although it does not exclude one) and claim 1 of 10/567,740 requires one.

(II) The Rejection over Fukushima, et al.

Regarding the rejection over Fukushima, et al. (Science), the Science article was published in June 2003, less than one year before the filing date of the PCT application from which the present U.S. application claims priority and after the priority Japanese application. Applicants submit herewith a translation of Japanese Priority Patent Application No. 2002-307754, filed on October 23, 2002 and a certificate executed by Satori Tsutsui, Applicants' Agent in Japan, declaring that the translation is true and accurate.

The content of the Japanese priority application is substantially identical to that of the subject application, and thus discloses the subject matter presently claimed.

Accordingly, it is submitted that the Fukushima, et al. article is not properly a reference against the claims. Therefore, Applicants request that the rejection be withdrawn.

(III) The Remaining Rejections

Claim 1 has been amended to recite a gel comprising a carbon nanotube and an ionic liquid. The ionic liquid is a salt which assumes a molten state at or very near room temperature.

Support for the amendments to claim 1 are to be found in the specification in the paragraph starting at the end of page 4 and continuing to the first line of page 5. The cited references do not disclose such a composition. None of the references discloses an ionic salt as claimed. In particular, sodium carbonate, as used in Tennet, et al., and cationic polymers comprising quaternary ammonium salt, as used in Zhang, et al. are not ionic liquids, as presently claimed.

As noted in the present specification in the last paragraph on page 4, an ionic liquid, also referred to as a cold molten salt or simply as a molten salt, is a salt which assumes a molten state in a wide range of temperatures including ordinary temperature (room temperature)." An ionic liquid may be schematized by Figs. 1 and 2, given below.

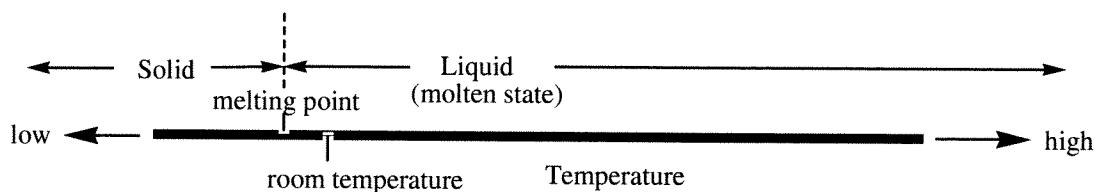


Fig. 1

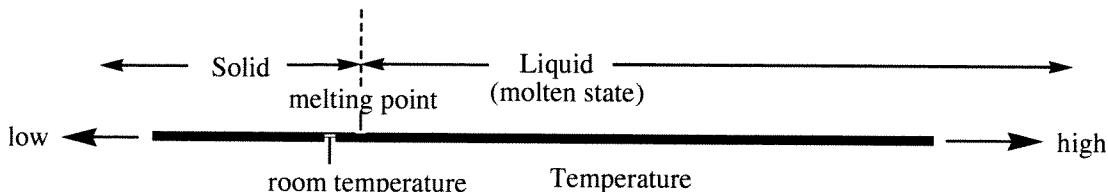


Fig. 2

Claim 1 encompasses both these embodiments.

In this respect, attention is drawn to literature references in the art. For example, in Rooney et al, "Handbook of Solvents," Chem. Tech. Publishing, Ed. Wypech, ISBN 1-895198-240 (2001), pages 1459-1471 (Reference W cited by the Examiner), it is noted that "Ionic liquids can be described in the crudest terms as room temperature molten salts." (lines 1-2, page 1459, 21.21 INTRODUCTION). Further, it is stated at lines 8-10 on page 1459: "Therefore an ionic liquid is normally described as a molten salt which is fluid at room temperature, or close to room temperature (salts melting below 100°C are often considered in this category)." A similar description is found in Wasserscheid, et al, "Ionic Liquid — New 'Solutions' for Transition Metal Catalysis" Angew. Chem. Int. Ed. 2000, 39, 3772-3789, at p. 3773.

The exemplary salts used in the working Examples have the following melting points, respectively: EMIBF₄ (6 to 15°C), BMIBF₄ (-82 to -81°C), HMIBF₄ (-82°C), BMIPF₆ (-61°C), BMITF₂N (-4°C). Each of these salts thus assume a molten state (liquid) at or about room temperature, falling within the scope of ionic liquid, as presently claimed.

Sodium carbonate (Na₂CO₃), as used by Tennet, has a melting point of 891°C and thus does not assume a molten state at room temperature or a temperature near room temperature but assumes a solid state. In the composition of Tennet, sodium carbonate is used as a catalyst. As noted in Example 18 (Columns 26-27) of Tennet, et al., the gel composition (fibril-aerogel composite) was prepared by mixing an aqueous solution of resorcinol and formaldehyde thoroughly with fibril (slurry) by ultrasonication, followed by addition of Na₂CO₃ (catalyst) and subjecting the mixture to 80°C. The gel thus obtained was washed with water to remove the catalyst (Na₂CO₃).

The sodium carbonate used by Tennet, is clearly not in a molten state and does not form a part of the gel composition.

Moreover, Tennet does not fairly suggest a gel composition as presently claimed. The gel formation mechanism of the aerogel composite of Tennet is different from that of the gel composition of the present invention. In Tennet, the gel is formed by catalytic polymerization of monomers, resulting in increased viscosity. For example, in Example 18, resorcinol and formaldehyde are polymerized using Na₂CO₃ catalyst, in the presence of fibrils, to form crosslinked polymer. Thus, Tennet does not suggest any need for an ionic liquid which assumes a molten state at about room temperature.

Regarding Zhang, et al., this reference discloses a cationic polymer comprising quaternary ammonium such as poly(diallyldimethyl ammonium) salt and copolymer salts of diallyldimethylammonium and acrylamide, as described at column 4, line 32-column 5, line 9 of Zhang is not an ionic liquid as claimed. The compound is a polymer, which will not assume a molten state at room temperature or at a temperature near room temperature.

Moreover, the cathode of Zhang, et al. is a solid composite. See, for example, the Abstract and column 1, lines 8-9, "The present invention pertains to solid composite cathode(s)." Zhang makes one reference to the cathode as being optionally "gel-like,"

but provides no distinguishing characteristics from which it can be determined what is meant by this phrase. Moreover, while Zhang refers to “gel-polymer electrolytes” (column 6, line 10; column 16, line 9; column 16, lines 16, 17), “gel forming (plasticizing) agent” (column 16, line 16), and “gelling agents” (column 16, line 41), these phrases refer to cell electrolytes for use in the device of Zhang, et al. Moreover, they are not gels of the composition presently claimed.

Accordingly, it is submitted that claim 1 and claims 2-5 distinguish patentably and unobviously over Tennet and Zhang.

Smalley, cited against claims 3-5, does not supply the deficiencies of the primary references. Sodium chloride, as used in Smalley, et al., has a melting point of 801°C (see, for example, Table 21.2.1., page 1461 of Rooney et. al. “Handbook of Solvents.”, discussed above). Sodium chloride is therefore not an ionic liquid as presently claimed.

Regarding claim 5, the Examiner appears to have misunderstood claim 5. Applicants have therefore amended claim 5 to recite a “method of using,” which is a more commonly understood term in the US than “working.” The Examiner argues that “the prior art teaches pouring the components into a vial forming a desired shape by subjecting it to external force of gravity <injection/dispense> and washing the gel by contacting it with water (solvent) to remove the sodium carbonate (ionic liquid).” This passage in Tennet refers to making the composition, not to use of a gel. Moreover, when the sodium carbonate (which is not an ionic liquid, as discussed above) of Tennet is removed by washing with water, the gel is still in fluid state (as it contains water), lacking any shape.

Accordingly, it is submitted that the claims distinguish patentably and unobviously over the combination of Tennet or Zhang with Smalley.

CONCLUSION

For the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 1-5) are now in condition for allowance.

Respectfully submitted,

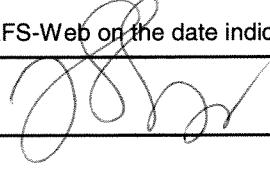
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